

iron and inevitable impurities,

- casting the steel in the form of a slab,
- hot-rolling the slab at a temperature above A_{r3} to obtain a strip of hot-rolled sheet,
- coiling the hot-rolled sheet,
- cold-rolling the hot-rolled sheet into the form of an intermediate cold-rolled sheet,
- continuously annealing the intermediate cold-rolled sheet at a temperature below A_{c1} ,
- rerolling the intermediate cold-rolled sheet down to a final sheet thickness for

drawing,

wherein said hot-rolled sheet is coiled at a temperature between 530°C to 570°C .

4p
e1
9. Process according to Claim 8, wherein the steel comprises at most 0.001% titanium by weight and at most 0.001% niobium by weight and wherein the cold-rolled sheet is annealed at a temperature below 700°C for a time of less than 3 minutes.

3 10. Process according to Claim 9², wherein the hot-rolled sheet has a thickness of about 2.3 mm, the hot-rolled sheet is rolled with a reduction ratio of between 85 and 89%, the cold-rolled intermediate sheet is annealed by continuous annealing at a temperature of approximately 650°C , for approximately twenty seconds, and the cold-rolled intermediate sheet is rerolled in a skin-pass rolling mill with a reduction ratio of between 23 and 31%.

5p
e2
11. Process according to Claim 9, wherein the hot-rolled sheet has a thickness of about 3 mm, the hot-rolled sheet is cold rolled with a reduction ratio of 90 to 93%, the intermediate cold-rolled sheet is continuously annealed at a temperature of about 670°C for a time of about thirty seconds and, after annealing, the intermediate sheet is rerolled in a skin-pass rolling mill with a reduction ratio of between 2.5 and 17%.

5 12. Process according Claim 8¹, wherein the steel is killed in contact with a slag having an adjusted amount of aluminum and of alumina.

5 13. Process according to Claim ⁵12, wherein the steel is cast in the form of a slab in a inert-atmosphere continuous casting plant.

14. A thin sheet of ultra-low-carbon steel, comprising, by weight, between 0.10 and 0.35% manganese, less than 0.006% nitrogen, less than 0.025% phosphorus, less than 0.020% sulphur, less than 0.020% silicon, a total amount of the elements copper, nickel and chromium of at most 0.08%, at most 0.006% carbon and at most ^{0.010}~~0.020~~% aluminum, iron and inevitable impurities, the thin sheet being obtained by cold rolling a hot-rolled sheet by a first rolling operation and by a second rolling operation separated by a continuous annealing operation, wherein it has a homogeneous structure with equiaxed grains and it has a Lankford coefficient (r_{aver}) greater than 1.6 and a plane anisotropy coefficient (ΔC) close to 0.

15. Process according Claim ²9, wherein the steel is killed in contact with a slag having an adjusted amount of aluminum and of alumina.

16. Process according Claim ³10, wherein the steel is killed in contact with a slag having an adjusted amount of aluminum and of alumina.

17. Process according Claim ⁴11, wherein the steel is killed in contact with a slag having an adjusted amount of aluminum and of alumina.

18. The process of Claim 2, wherein the cold-rolled sheet is annealed at a temperature below 700°C for about thirty seconds.

19. The process of Claim ¹8, wherein said steel comprises 0.0022-0.0050% nitrogen.

20. Process for producing a thin sheet of ultra-low-carbon steel, said process comprising:

-producing a killed and vacuum-degasses steel comprising, by weight, between 0.10 and 0.35% manganese, less than 0.006% nitrogen, less than 0.025% phosphorus, less than 0.020% sulphur, less than 0.020% silicon, a total amount of the elements copper, nickel and chromium of at most 0.08%, at most 0.006% carbon and at most 0.020% aluminum,

iron and inevitable impurities,

-casting the steel in the form of a slab,

-hot-rolling the slab at a temperature above Ar3 to obtain a strip of hot-rolled sheet,

-coiling the hot-rolled sheet,

-cold-rolling the hot-rolled sheet into the form of an intermediate cold-rolled sheet,

continuously annealing the intermediate cold-rolled sheet at a temperature below Ac1,

rerolling the intermediate cold-rolled sheet down to a final sheet thickness for

drawing,

wherein the said hot-rolled sheet is coiled at a temperature between 530°C to 620°C.--

greater than
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SUPPORT FOR AMENDMENTS

The amendments to the claims are supported by the claims as originally filed and the original specification. No new matter has been entered. Claims 8-20 are pending.

REMARKS

The rejections presented in the Official Action are traversed. As noted by the new set of claims, a patentable process and thin sheet of ultra-low-carbon steel have been described and claimed herein. Moreover, the Examiner's comments presented under 35 U.S.C. §112 have been addressed. It is thus believed that the present claims are allowable over the prior art.

The present claims specify particular ranges of carbon, aluminum and a total amount of copper, nickel and chromium. In addition, the content of manganese, nitrogen, phosphorus, sulfur and silicon have been specified and defined. None of the prior art references disclose or suggest this particular combination of elements nor this steel in combination with the presently claimed process steps for producing a thin sheet.